define the zones. Further, the systems and methods can also be used in contact based applications.

[0022] The systems and methods described herein can be used in connection with many different types of medical imaging systems. By way of example, set forth below is a description of one type of X-ray imaging system **10**, illustrated in **FIG. 1**. Again, system **10** is described herein as an example only, and the systems and methods described herein can be used in connection with many different types of medical imaging systems, e.g., X-ray, computed tomography, magnetic resonance, positron emission tomography, and ultrasound.

[0023] More specifically, and referring to **FIG. 1**, imaging system **10** is shown as including a base **14** and a positioning arm **16**. Base **14** extends from a portable platform **18** having a plurality of wheels **20** so that base **14** is movable relative to an object or patient **50** to be imaged. Rather than wheels **20**, other position altering devices can be employed. For example, a pivot can be provided to allow tilting and rotating arm **16** of the imaging equipment.

[0024] Arm **16** includes a first end portion **22** and a second end portion **24**. More specifically, arm **16** rotates relative to base **14** about an axis of rotation and moves relative to base **14** to alter the respective distances between arm first end portion **22** and base **14** and arm second end portion **24** and base **14**.

[0025] An x-ray source assembly **26** is movably coupled to arm first end portion **22**. X-ray source assembly **26** includes an X-ray source **28** configured to emit x-ray signals. A detector assembly **30** is movably coupled to arm second end portion **24**. Detector assembly **30** includes a detector **32** configured to receive the x-ray signals from said source **28** to generate an image of the object. Detector **32** can be moved up and down using a motorized control.

[0026] By moving arm **16** relative to base **14**, the position of source assembly **26** may be altered so that source assembly **26** is moved toward or away from base **14**. Altering the position of source assembly **26**, alters the position of detector assembly **30** relative to base **14** in an opposite direction. The orientation of assembly **26** and assembly **30** to the patient affects the image generated.

[0027] Detector **32**, in one embodiment, is formed by a plurality of detector elements **34** which together sense projected x-rays that pass through an object. In the example embodiment, detector **32** is a flat panel, an image intensifier, or film. In one embodiment, detector **32** is a solid state detector or radiation imager comprising a large flat panel imaging device having a plurality of pixels **34** arranged in rows and columns. Again, the systems and methods described herein are not limited to use with any one particular type of detector.

[0028] System **10** also includes a table **46** for supporting patient **50**. To generate an image of patient **50**, arm **16** is rotated so that source assembly **26** and detector assembly **30** rotate about patient **50**. More specifically, arm **16** is rotatably coupled to base **14** so that detector **32** and source **28** are rotated about object **50**.

[0029] Movement of arm **16** and the operation of x-ray source assembly **26** and detector assembly **30** are governed by a control mechanism **52** of system **10**. Controller, or control mechanism, **52** includes an x-ray controller **54** that provides power and timing signals to x-ray source **28** and a motor controller **56** that controls the position of arm **16**, source assembly **26** and detector assembly **30**.

[0030] In the example embodiment, a data acquisition system (DAS) **58** in control mechanism **52** samples data from detector **32** for subsequent processing. An image processor/reconstructor **60** (the term reconstructor as used herein includes reconstructors as are known in the computed tomography art, as well as processors for processing data collected in a scan (i.e., not limited to computed tomography image reconstructors)) receives sampled x-ray data from DAS **58** and performs high speed image processing/reconstruction. The resultant image is applied as an input to a computer **62** which stores the image in a mass storage device **63**.

[0031] Computer **62** also receives commands and scanning parameters from an operator via a console **64** that has a keyboard. One or several associated displays **66** allows the operator to observe the resultant image and other data from computer **62**. The operator supplied commands and parameters are used by computer **62** to provide control signals and information to DAS **58**, x-ray controller **54** and motor controller **56**. Computer **62** operates a table motor controller **68** which controls position of motorized table **46** relative to system **10**.

[0032] In one embodiment, the user input device comprises multiple capacitance sensors located on base **14**, source assembly **26**, detector **32**, positioning arm **16**, and table **46**. Each sensor yields information about the proximity of the operator (e.g. operator's hand) and other objects (e.g. patient body) relative to the sensor. The information from each sensor is processed (e.g., by computer **62**) using a vector addition algorithm, as described below.

[0033] More specifically, the general principles of the vector addition algorithm are described below with respect to **FIGS. 2, 3**, and **4**. Referring to **FIG. 2**, there are no external obstacles illustrated, and the objective is to move a device **80** as an operator's hand **82** approaches device **80**. Device **80** moves directly away from operator's hand **82**. The closer hand **82** is to device **80**, the faster device **80** moves away from hand **82**. The operation becomes slightly more complicated as the potential for external objects, or the control of multiple operators, becomes possible. These more complicated cases are illustrated in **FIGS. 3 and 4**.

[0034] In **FIG. 3**, the operator is requesting that device **80** move away from hand **82**, yet move directly into an obstacle **84**. The system should respond by moving away from hand **82**, and then slowing down as device **80** approaches obstacle **84**. Eventually, device **80** should find an equilibrium position between hand **82** and obstacle **84** without directly contacting either hand **82** or obstacle **84**.

[0035] **FIG. 4** illustrates a case in which there is a trajectory along which device **80** can move while satisfying the operators request to "move left" while simultaneously avoiding obstacle **84**. In order accomplish the functionality illustrated in **FIGS. 3 and 4**, both the location and proximity of various objects along the device periphery should be known.

[0036] Although the illustrations in **FIGS. 2, 3**, and **4** appear two-dimensional, the principles can be easily gener-